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NAVIGATION AND IRRIGATION PROBLEMS OF SOVIET POWER PROJECTS

L. P. Lavrinovich

In addition to affecting electric power supply and navigation, the Kuybyshev and Stalingrad hydroelectric power plants will have great significance in regard to irrigation. For the irrigation of regions beyond the Volga River, it is planned to deliver 12 billion cubic meters of water, or about 5 percent of the total average yearly discharge of the Volga. The average yearly expenditure of water for irrigation will amount to about 360 cubic meters per second, which is about equal to the mean discharge of the lower Oka River.

In regard to the future ship-passing installations of these hydroelectric projects, it must be kept in mind that after the irrigation of the trans-Volga area, freight turnover on the Volga will increase sharply, and the time is not far off when two sets of locks on the Volga will be insufficient, especially in regard to the increasing demand for passenger transport. Therefore, for the extra handling of passenger ships passing by the new projects, it would be necessary to provide for the construction of ship-raising installations or for special locks large enough to accommodate the large passenger ships of the future.

With the great expansion of passenger traffic on the Volga, losses of water and time in large locks would be very great. Thus, it will be necessary to increase the speed of filling and emptying the chambers of the locks. In the Shcherbakov Lock, the time for emptying a large chamber has been reduced to 7 minutes 40 seconds, which amounts to a drop in the water level of 4 centimeters per second. The largest expenditure of water in these operations amounts to about 600 cubic meters per second. This is, of course, not a limit, and if special locks are built, especially using wedge-shaped forms for the entrance ends of the filling galleries and lengthwise galleries, the time for filling and emptying the locks can be cut to about 4 minutes.

The designs of the head installations of the gravity-fed main line irrigation canals should be such as to permit ships to go unhindered from the river to canal and vice versa. These canals will expend water to a considerably greater extent than the Canal imeni Moskva, and it is absolutely necessary to use them for traffic.

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The Amu-Dar'ya River has been very little used for irrigation and navigation, inasmuch as it has had difficult channel conditions and there has been no connection with the river basins of the European part of the USSR. Connection of the isolated Aral basin with the Volga will be effected by directing the waters of the Amu-Dar'ya toward the Caspian Sea.

The dimensions of the Main Turkmen Canal should be such as to permit ships to go from the source of the Amu-Dar'ya to the Caspian Sea and further along the Volga without breaking cargo.

Since the dam on the Amu-Dar'ya will have low pressure, there will be no reservoir on the upper stretch and the head of water will extend only for 30 kilometers; navigation conditions on the upper stretch should be improved by dredging operations. It must be kept in mind that below the dam at Takhia Tash the channel conditions of the river will become considerably complicated, especially in March, April, and May, when the demand for water for irrigation will be great. Also, the discharge of the river at this time is little amounting, on the average, in March to 990 cubic-meters per second, in April 1,700 cubic meters per second, and in May 3,150 cubic meters per second. In June the average discharge is 4,500 cubic meters per second, in July 4,900 cubic meters per second, and August 3,200 cubic meters per second. The smallest discharge is from November through February (from 880 to 920 cubic meters per second). The largest discharge takes place in the hottest days (up to 10,000 cubic meters per second), when ice melts in the upper reaches of the river and its tributaries. In the Aral Sea, channel conditions change as a result of the lowering of the water level, especially at the approaches to docks.

The South Ukrainian Canal, with a discharge of 650 cubic meters per second, should have a cross section greatly exceeding the cross section of the Canal imeni Moskva.

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